



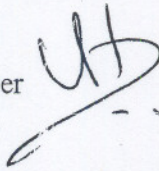
STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
800 BAY ROAD
P.O. Box 778
DOVER, DELAWARE 19903

NATHAN HAYWARD III
SECRETARY



MEMORANDUM

TO: Ralph Reeb, Director, Planning
Mike Angelo, Assistant Director, Transportation Engineering
Mike Simmons, Assistant Director, Transportation Engineering
Dennis O'Shea, Assistant Director, Transportation Engineering
Bob Taylor, Assistant Director, Transportation Engineering
Tom Clements, Assistant Director for Construction, North Region
Natalie Barnhart, Assistant Director of Construction, South Region
Andy Bowman, North District Engineer
Mark Alexander, Canal District Engineer
Joe Wright, South District Engineer
John Eustis, Contract Administrator

FROM: Vasuki Hiraesave, Central District Engineer 

DATE: June 14, 2004

SUBJECT: Recessed Pavement Markers (RPMs)

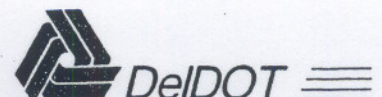
The memo issued by Jim McNinch on May 7, 2004 on recessed pavement markers inadvertently left out figures one through eight from the guidelines. Please find enclosed figures 1-8 and include them as part of the memorandum. I have attached a copy of the memorandum for your use. I apologize for any inconvenience.

If you have any questions, please contact Vasuki Hiraesave at 760-2412 or Kevin Canning at 760-2288.

VH:jkw
Attachment

cc: Carolann Wicks, Chief Engineer
James R. McNinch III, Director, Maintenance and Operations
Terry Petrucci, Director of Public Relations
Christina Bell, Director of Finance
Mike Svaby, Deputy Director of Technology and Support Services
Matthew Hake, FHWA, Construction and Materials Engineer
Daniel Montag, FHWA, Construction and Materials

Working Committee Members:
Chao Hu, Transportation Solutions
Don Weber, Chief Traffic
George Nagase, Specifications Engineer
Kevin Canning, Quality Engineer
Robert Hutson, Jr., Signs and Markings
Joe Ellis, Quality (COMTECH Manager)





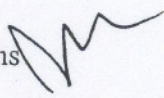
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John Eustis, Contract Administrator

FROM: James R. McNinch III, Director, Maintenance and Operations 

DATE: May 7, 2004

SUBJECT: Raised Pavement Markers (RPMs)

As a follow-up to the memo regarding Durable Pavement Markings issued on March 6, 2003, the working committee that reviewed these striping directives has developed specifications and design guidelines for the use of RPMs in our design projects. As a result, the attached guidelines were recommended and should now be implemented for RPMs on all upcoming construction projects with an estimated PS&E date of July 1, 2004.

For other contracts already in construction, Division of Transportation Solutions construction personnel should evaluate the change to RPMs on an individual project basis and appropriate addendums will be issued for those contracts currently in the bidding process.

If you have any questions, please contact Vasuki Hiraesave at 760-2412 or Kevin Canning at 760-2288.

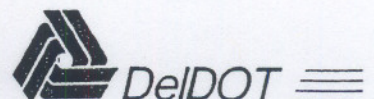
JRM:vhw

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Robert Hutson, Signs and Markings
Joe Ellis, Quality (COMTECH Manager)





Delaware Department of Transportation

Recessed Pavement Markers Guidelines



I. Introduction:

Raised/Recessed Pavement Markers (RPMs) are in-roadway delineation devices that provide positive guidance to motorists during periods of darkness, especially during inclement weather and in areas where roadway alignment changes dictate a need for additional guidance that cannot be adequately accomplished by pavement markings, signing, and roadside delineation.

II. Specifications: Refer to the special provision for Item No. 748502 – Raised/Recessed Pavement Markers.

III. Placement:

A. RPMs shall be installed in the following locations:

1. Interstate highways (I-95, I-495, I-295) and freeways (SR-1 from I-95 to the Dover Air Force Base, Route 141 from I-95 to north of Route 2): Refer to Figure 1 – Figure 3 for layout details for roadway section on ramps and exit ramps.
2. Principal arterials (US 13, US 113, Route 40, SR-1 south of the Dover Air Force Base, Route 2, Route 202, etc.): Refer to Figure 4 – Figure 8 for layout details.

B. RPMs should be considered for use on two-lane, two-way arterial roads under the following conditions:

1. Roadways with posted speed limits of 45 MPH or greater, with horizontal and/or vertical curves and poor lighting.
2. Locations with a history of run-off-the-road accidents.
3. Locations with advisory speed postings.
4. Locations where the barrier or parapet is less than 6 feet from the edge of the travel lane.

C. All other locations will be determined after review by the Traffic Section or Signing and Pavement Markings Section.

D. Edge Lines:

1. Other than to delineate off ramps and gore areas, RPMs are not to be installed along edge lines (right or left) unless there is a history of run-off-the-road and/or nighttime inclement weather accidents. RPMs should only be installed on the edge line if other measures have been taken and the location continues to experience accidents. These other measures include:
 - a. Adding roadway delineation (post mounted)
 - b. Adding wide edge lines
 - c. Installing post mounted Chevrons
 - d. Installing advance warning signs
 - e. Installing centerline or lane line RPMs
 - f. Installing edge line/shoulder rumble strips
2. If overhead lighting is present, even though all other measures have been completed, RPMs should not be placed on the edge line (right or left) because they lose their effectiveness under overhead lighting.

E. Spacing of permanent RPMs should be as shown on the attached details or as follows:

1. Tangents, centerline only, spaced every 80 feet.
2. On curves, centerline only, spaced every 40 feet.
3. In gore areas, spaced every 20 feet.
4. Turn lanes, bypass lanes, and medians should be as shown on the attached details.

IV. Bridges

- A. RPMs should be installed on all new bridge decks when they are being used on adjacent roadway.
- B. RPMs should be installed on existing bridges if the following conditions are met:
 1. RPMs have been installed in the adjacent roadway for reasons listed in Section III above.
 2. The bridge is a length where at least three (3) markers would be used (approximately 200 feet).
 3. The bridge has a history of accidents attributed to these conditions correctable by the installation of RPMs (sideswipe, fixed objects, etc.). Before RPMs are installed, other corrective actions should be taken, such as installing wider pavement markers and delineating the parapet walls.

4. Under certain conditions RPMs should not be placed on a bridge. These are as follows:
 - a. If the bridge deck is expected to be replaced within the next two to three years. RPMs may be installed under this condition if an extreme safety hazard correctable by the installation of RPMs exists.
 - b. Overhead lighting is present.
 - c. Less than three (3) markers would be used.

V. Final Acceptance and Maintenance of the RPMs Installation:

- A. The Signing and Pavement Marking Section must inspect all RPM installations prior to final acceptance. The construction project manager should notify the Signing and Pavement Markings Section so they can schedule an inspection, which will include taking reflectivity readings.
- B. The Signing and Pavement Markings Section will track locations where RPMs have been installed in a database and will inspect the locations periodically.
- C. All locations that have been designated to have RPM reflectors replaced shall have all missing or damaged castings replaced as well. The new casting should not be placed in the original location as the one it is replacing but should be relocated longitudinally to an area as close as possible to the original installation.
- D. Depressions left from the missing RPM shall be filled with a material approved by Materials and Research.

For other contracts already in construction, construction district should evaluate the change to raised pavement markers on an individual project basis and appropriate addendums will be issued for those contracts currently in the bidding process.

Recessed Pavement Markers (RPM)

For Interstate Highways and Freeways

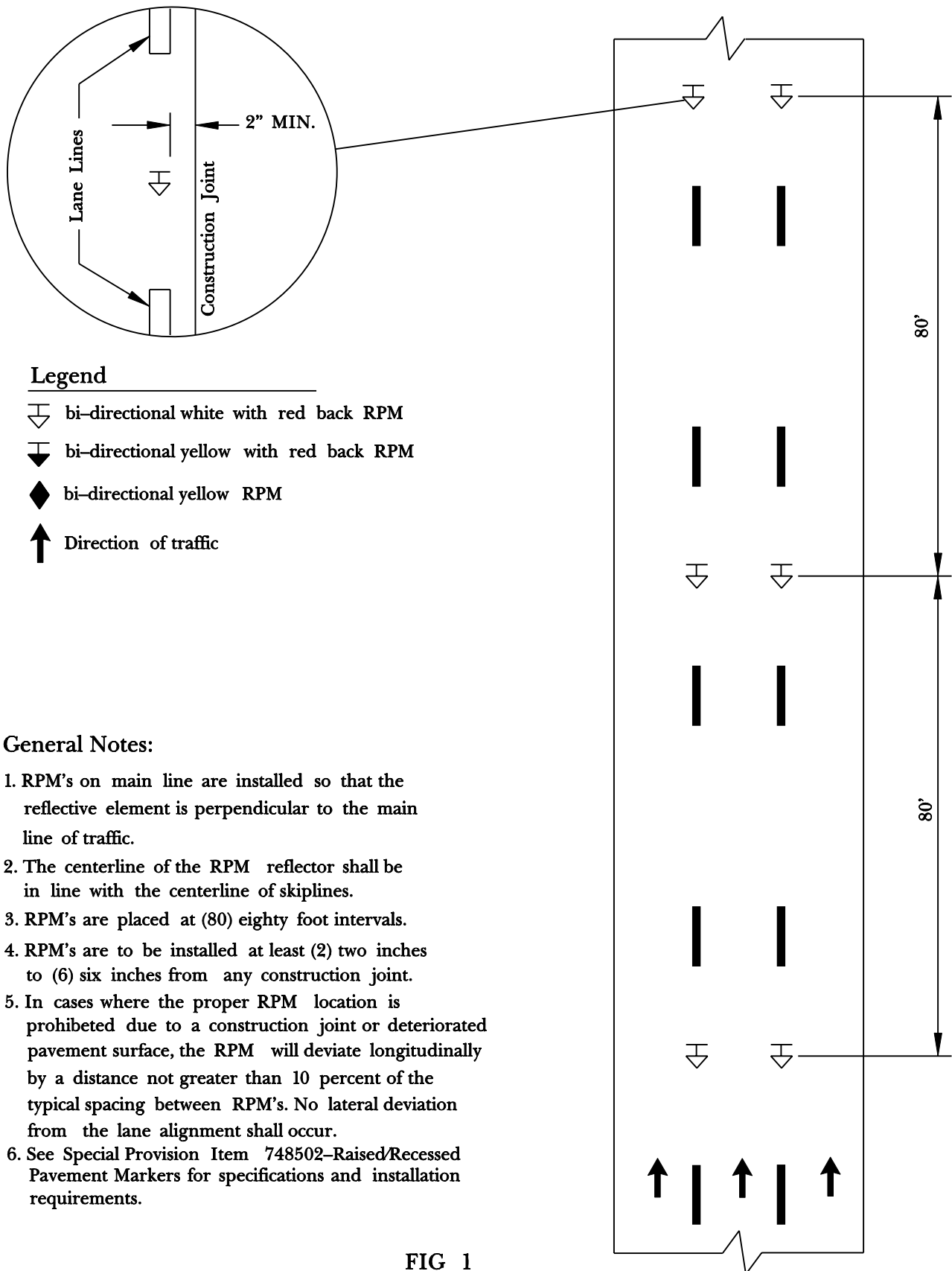
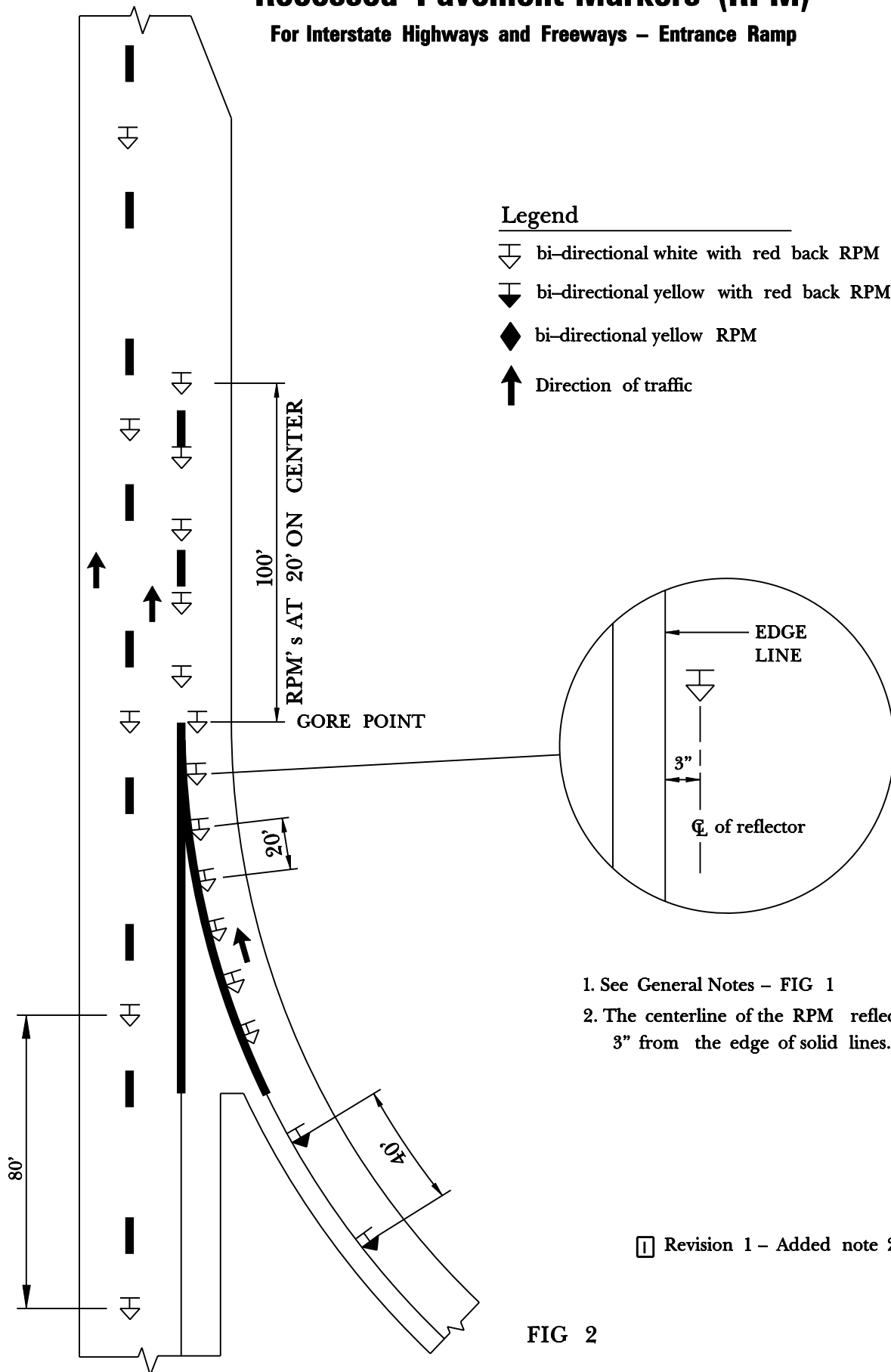


FIG 1

Recessed Pavement Markers (RPM)

For Interstate Highways and Freeways – Entrance Ramp

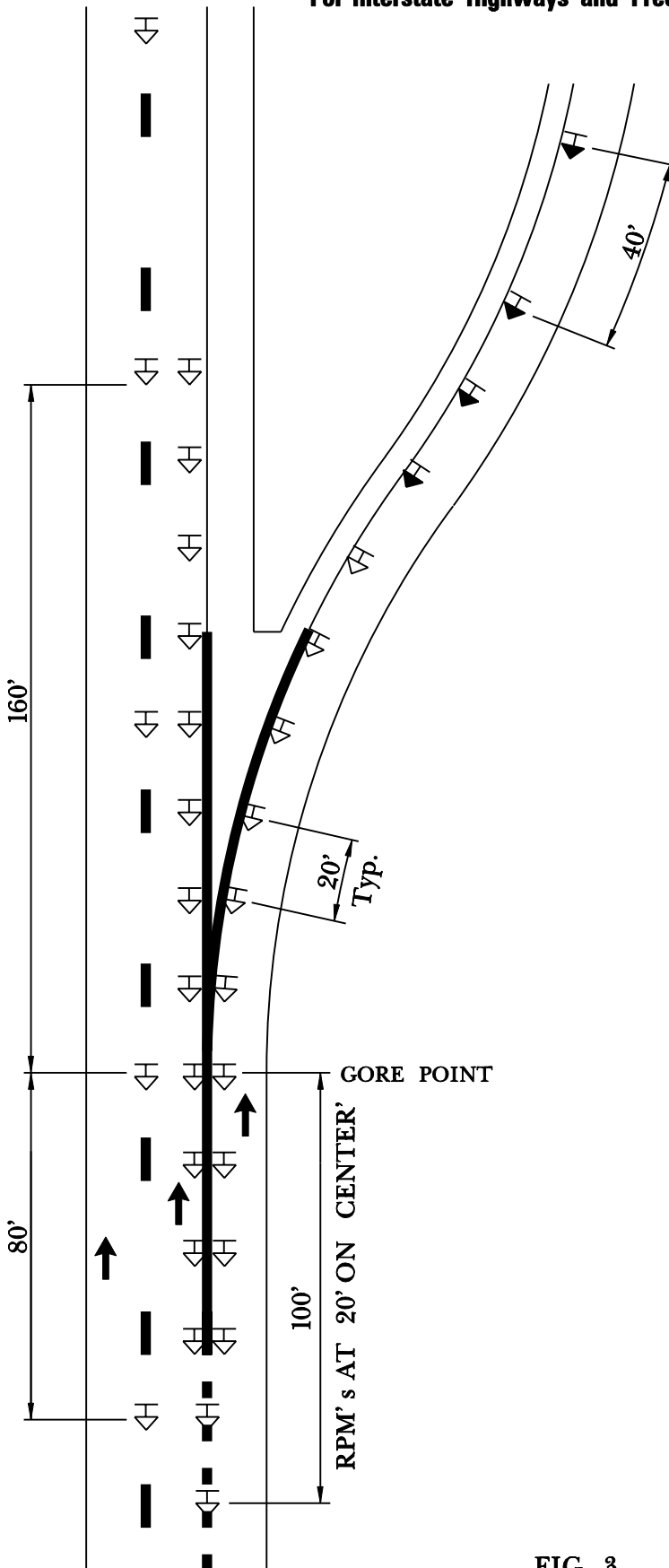


Revision 1 – Added note 2/22/05 SCG

FIG 2

Recessed Pavement Markers (RPM)

For Interstate Highways and Freeways – Exit Ramp



Legend

- ▽ bi-directional white with red back RPM
- ▽ bi-directional yellow with red back RPM
- ◆ bi-directional yellow RPM
- ↑ Direction of traffic

1. See General Notes – FIG 1
2. The centerline of the RPM reflector shall be 3" from the edge of solid lines.

FIG 3

Recessed Pavement Markers (RPM)

For Principle Arterials and Arterial Roads

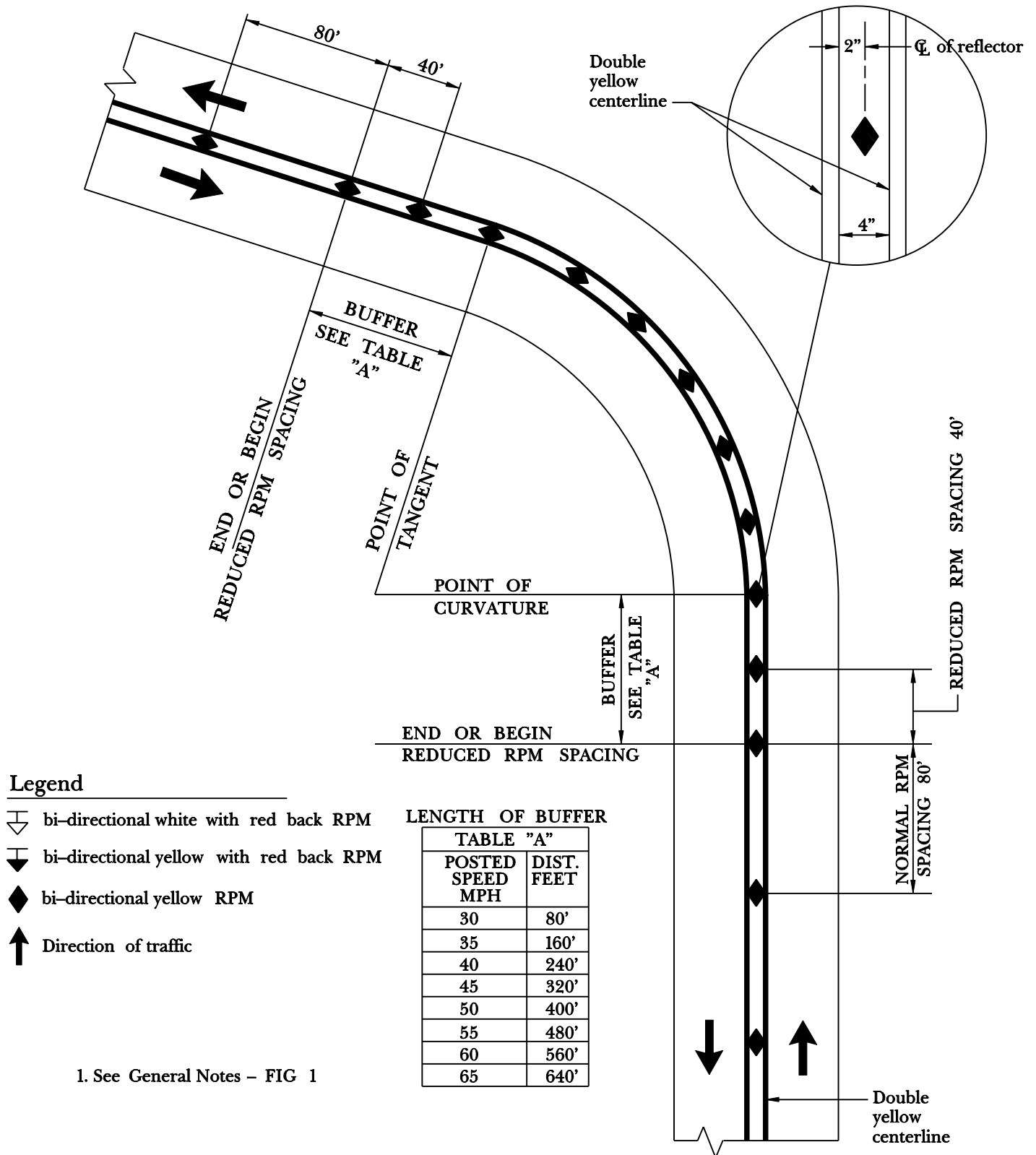
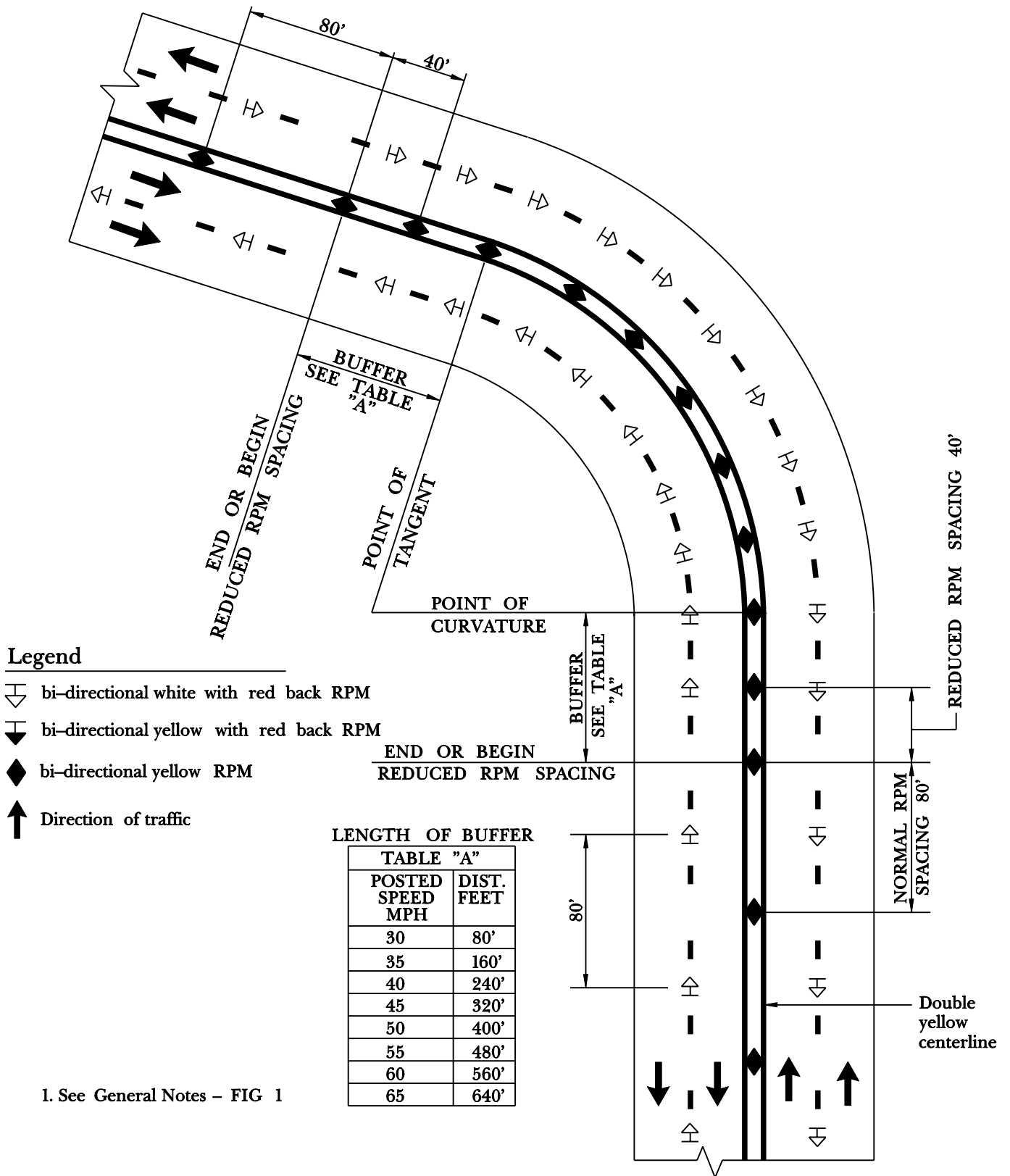


FIG 4

Recessed Pavement Markers (RPM)

For Principle Arterials and Arterial Roads with Multiple Lane Applications



1. See General Notes – FIG 1





Recessed Pavement Markers (RPM)

For Left Turn Lanes on Principle Arterials and Arterial Roads

Notes:

1. See Figure 1 for General Notes
2. RPM's supplementing the double solid yellow centerline are installed so that all markers are installed between the double solid lines.
3. RPM's supplementing the yellow centerline along the left turn lane are spaced 20' apart for the entire length of the turn lane if equal to or less than 200'. If the turn lane is greater than 200' then RPM's are spaced at 40' throughout the entire length of the turn lane.

Legend

-  bi-directional white with red back RPM
-  bi-directional yellow with red back RPM
-  bi-directional yellow RPM
-  Direction of traffic

LENGTH OF BUFFER

TABLE "A"	
POSTED SPEED MPH	DIST. FEET
30	80'
35	160'
40	240'
45	320'
50	400'
55	480'
60	560'
65	640'

Double yellow centerline

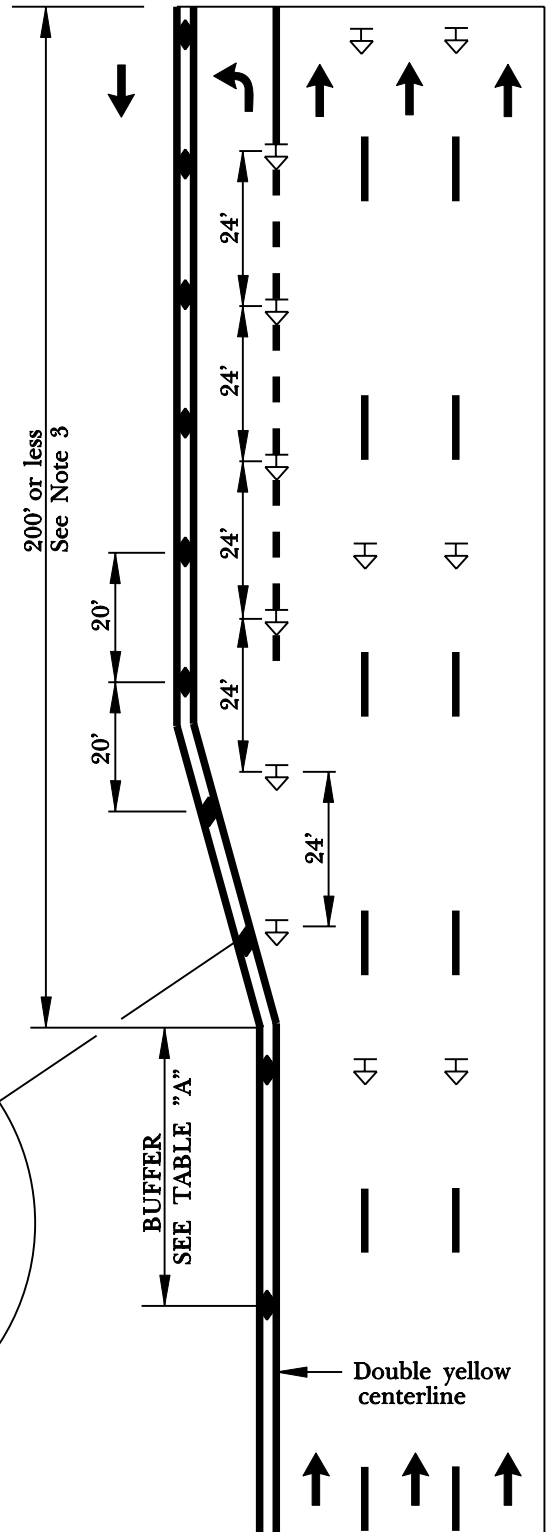
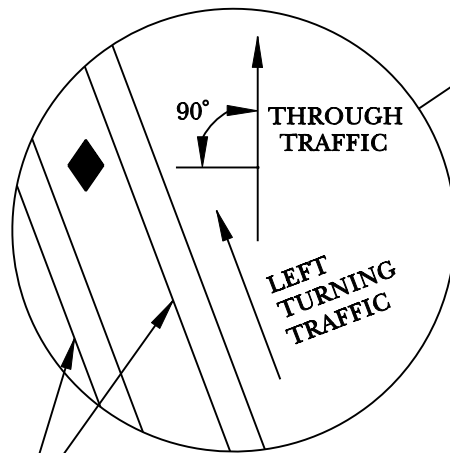






FIG 6

Recessed Pavement Markers (RPM)

Auxilliary lane lines for By-pass lane

Legend

-  bi-directional white with red back RPM
-  bi-directional yellow with red back RPM
-  bi-directional yellow RPM
-  Direction of traffic

1. See General Notes – FIG 1

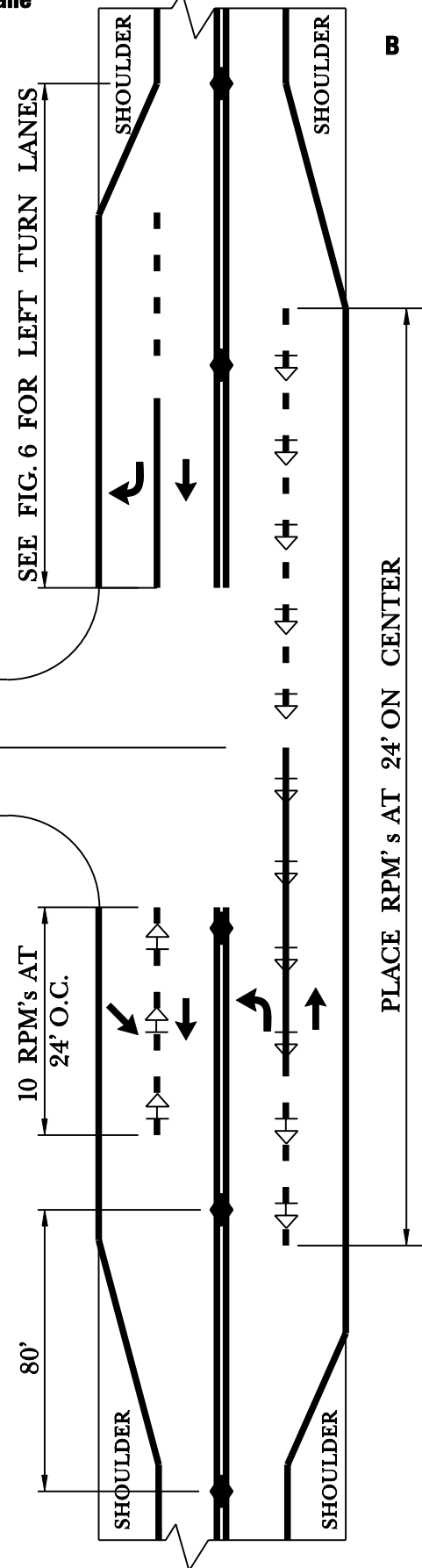


FIG 7

Recessed Pavement Markers (RPM)

For Left Turn Lanes (Flush Median) on Principle Arterials and Arterial Roads

